G52... Vector Geometry
Arithmetic

•

OCR

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12 **(a)** $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

G52

Work out $5\overrightarrow{PQ}$.

(a) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[1]**

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(b) Find the values of *h* and *k*.

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$$\begin{pmatrix} h \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ k \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

(b) $h =$ ....

$k =$ .... **[2]**

(c) Triangle ABC is drawn on a coordinate grid.

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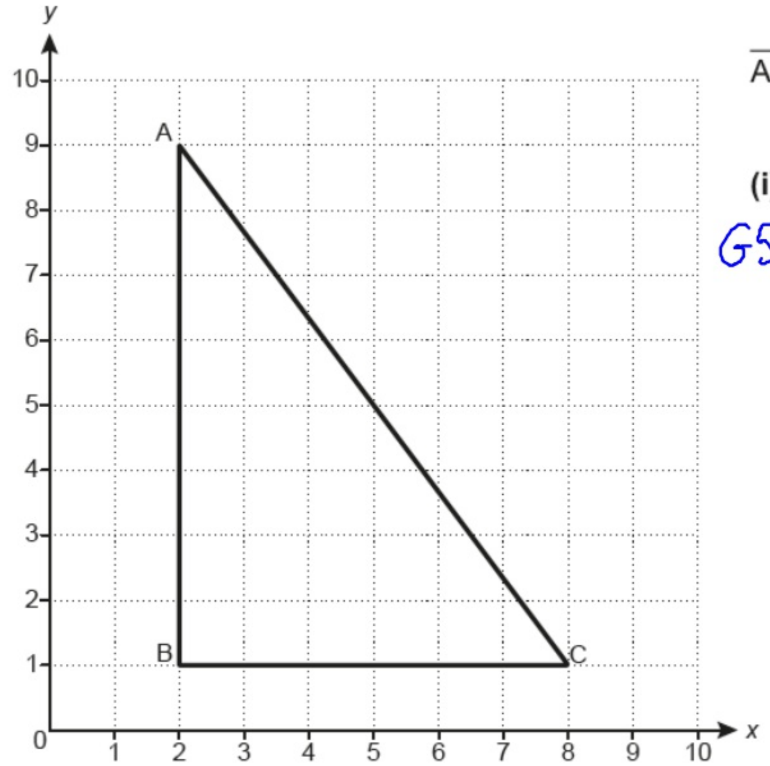

$\overrightarrow{AB} = \begin{pmatrix} 0 \\ ^-8 \end{pmatrix}$

(i) Use the diagram to complete this vector sum.

G52

$$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \begin{pmatrix} 0 \\ ^-8 \end{pmatrix} + \begin{pmatrix} \quad \\ \quad \end{pmatrix} + \begin{pmatrix} \quad \\ \quad \end{pmatrix} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$$

(ii) Give a reason why the answer to the sum could be written down **without doing any working**.

....

.... **[1]**

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12 (a) $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

G52

Work out $5\overrightarrow{PQ}$.

$5\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

$5 \times \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

(a) $\begin{pmatrix} 15 \\ 20 \end{pmatrix}$ **[1]**

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(b) Find the values of h and k.

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$$\begin{pmatrix} h \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ k \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

h: $\square + 2 - 3 = 0$

$\square \to (+2) \to (-3) \to 0$

$1 \leftarrow (-2) \leftarrow (+3) \leftarrow 0$

$5 + \boxed{-2} - 3 = 0$

$\boxed{3} - 3 = 0$

(b) $h =$ ......1......

$k =$ ......-2...... **[2]**

(c) Triangle ABC is drawn on a coordinate grid.

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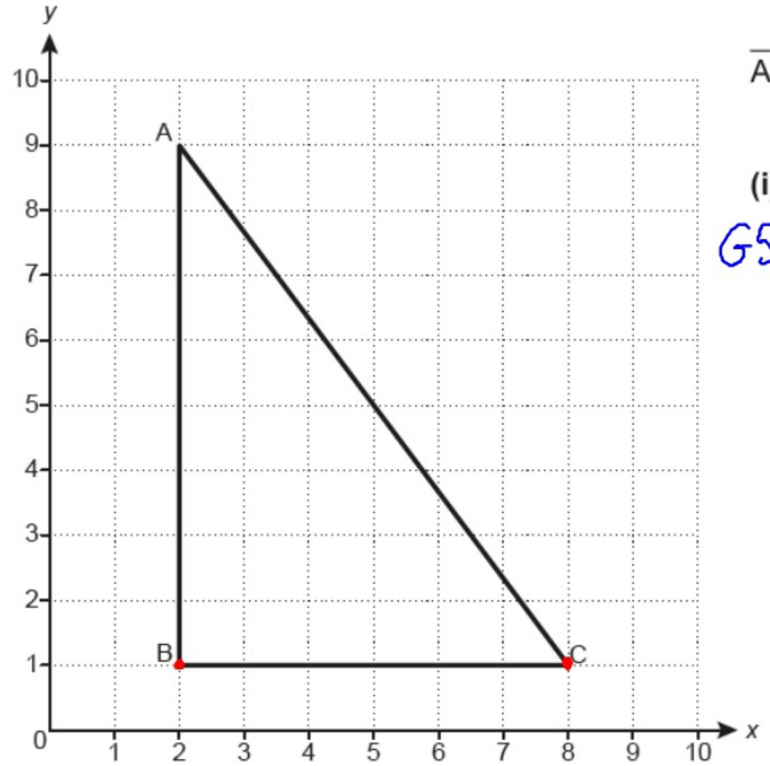

$\overrightarrow{AB} = \begin{pmatrix} 0 \\ -8 \end{pmatrix}$ — Right/left (+ / −), Up/Down (+ / −)

(i) Use the diagram to complete this vector sum.

G52

$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \begin{pmatrix} 0 \\ -8 \end{pmatrix} + \begin{pmatrix} 6 \\ 0 \end{pmatrix} + \begin{pmatrix} -6 \\ 8 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

(ii) Give a reason why the answer to the sum could be written down **without doing any working**.

Returning to the starting point so $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ is the answer. **[1]**

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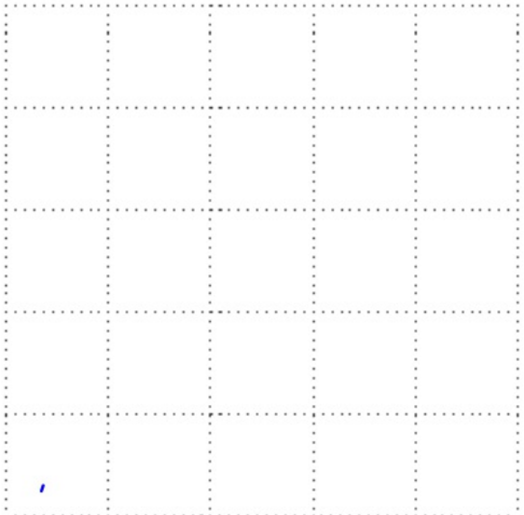
GS2
GS3

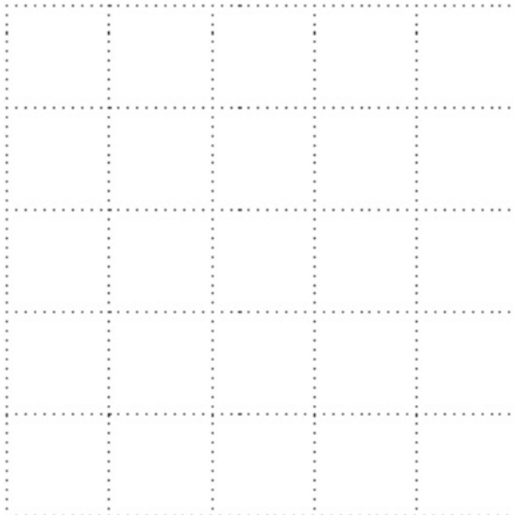
11 Vector $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, vector $\mathbf{b} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

(a) On each grid below, draw a vector to represent

(i) 2**a**,



(ii) **a** + **b**.



[2]

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$$\begin{pmatrix}2\\1\end{pmatrix} + \begin{pmatrix}-2\\1\end{pmatrix} = \begin{pmatrix}0\\2\end{pmatrix} \quad R/4 \times \quad \uparrow 2$$

11 Vector $\mathbf{a} = \begin{pmatrix}2\\1\end{pmatrix}$, vector $\mathbf{b} = \begin{pmatrix}-2\\1\end{pmatrix}$.

(a) On each grid below, draw a vector to represent

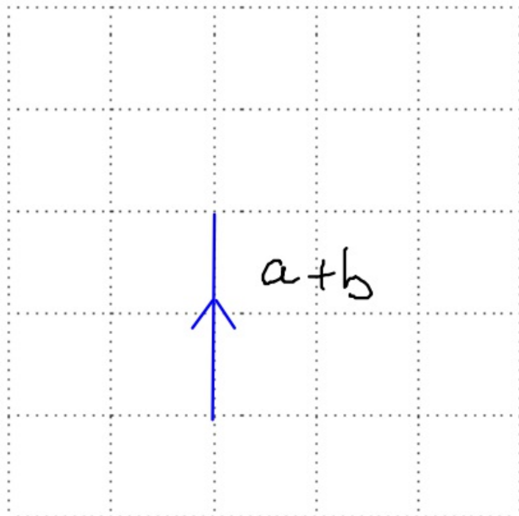
GS2
GS3

(i) 2**a**,

$$2\begin{pmatrix}2\\1\end{pmatrix}$$

$$\begin{pmatrix}4\\2\end{pmatrix} \quad \begin{matrix}R4\\U2\end{matrix}$$

(ii) **a** + **b**.



[2]

10 Two vectors, **a** and **b**, are shown on the 1 centimetre grid below.

G52
G53

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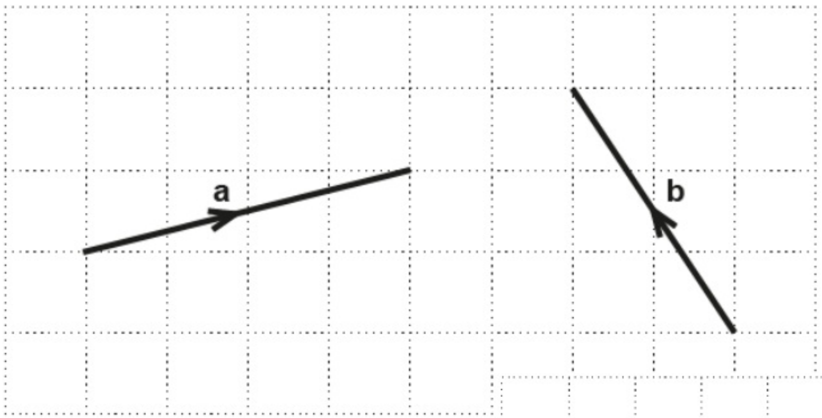

Show that the vector **a** + 2**b** has length 7 cm.
You may use the grid below.

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G53

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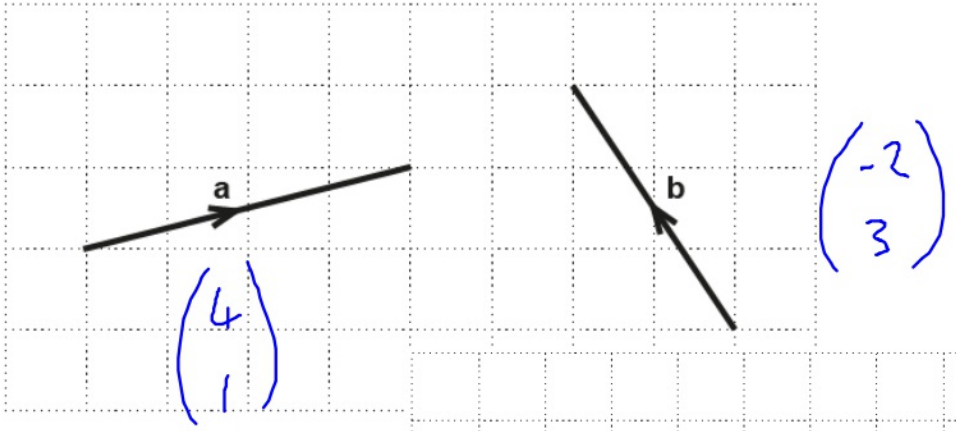

Show that the vector **a** + 2**b** has length 7 cm.
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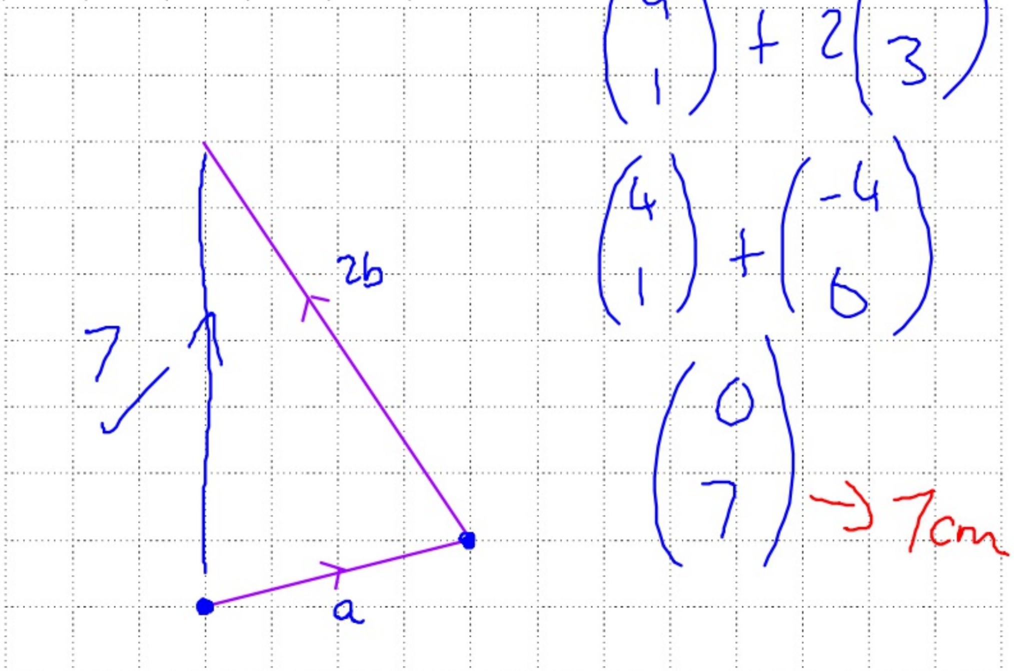

$\begin{pmatrix}4\\1\end{pmatrix} + 2\begin{pmatrix}-2\\3\end{pmatrix}$

$\begin{pmatrix}4\\1\end{pmatrix} + \begin{pmatrix}-4\\6\end{pmatrix}$

$\begin{pmatrix}0\\7\end{pmatrix} \rightarrow$ 7cm

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20 **(a)** **b** is a vector.

Given that $\mathbf{b} + \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ is parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$, find two possible answers for **b**.

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(a) $\mathbf{b} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ or $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[3]**

(b) Given that

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$$m\begin{pmatrix}4\\1\end{pmatrix}+n\begin{pmatrix}5\\2\end{pmatrix}=\begin{pmatrix}12\\6\end{pmatrix}$$

find the value of *m* and the value of *n*.

(b) $m =$ ....

$n =$ .... **[5]**

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20 **(a)** **b** is a vector.

Given that $\mathbf{b} + \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ is parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$, find two possible answers for **b**.

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Parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$

$$\begin{pmatrix} \ \\ \ \end{pmatrix} + \begin{pmatrix} 5 \\ 2 \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 5 \\ 2 \end{pmatrix} \quad \begin{pmatrix} 6 \\ 3 \end{pmatrix}$$

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} 5 \\ 2 \end{pmatrix} \quad \begin{pmatrix} 8 \\ 4 \end{pmatrix}$$

(a) **b** $= \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ or $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ **[3]**

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(b) Given that

G52

$$m\begin{pmatrix}4\\1\end{pmatrix}+n\begin{pmatrix}5\\2\end{pmatrix}=\begin{pmatrix}12\\6\end{pmatrix}$$

find the value of m and the value of n.

$4m + 5n = 12$

$1m + 2n = 6 \quad \times 4$

SSS

$4m + 5n = 12$

$- \; 4m + 8n = 24$

$3n = 12$

$n = 4$

$n = 4$

$4m + 5n = 12$

$4m + 20 = 12$

$\boxed{-8} + 20 = 12$

$4m = -8$

$m = -2$

(b) $m =$ .... -2 ....

$n =$ .... 4 .... **[5]**

EDEXCEL

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$\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$

....

(1)

(ii) $2\mathbf{a} + 3\mathbf{b}$

....

(2)

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4 $\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$

$\begin{pmatrix} 1 \\ 4 \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

$\begin{pmatrix} 4 \\ 6 \end{pmatrix}$

(1)

(ii) $2\mathbf{a} + 3\mathbf{b}$

$2\begin{pmatrix} 1 \\ 4 \end{pmatrix} + 3\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

$\begin{pmatrix} 2 \\ 8 \end{pmatrix} + \begin{pmatrix} 9 \\ 6 \end{pmatrix} =$

$\begin{pmatrix} 11 \\ 14 \end{pmatrix}$

(2)

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10 $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

$\overrightarrow{AB}$ is shown on the grid.

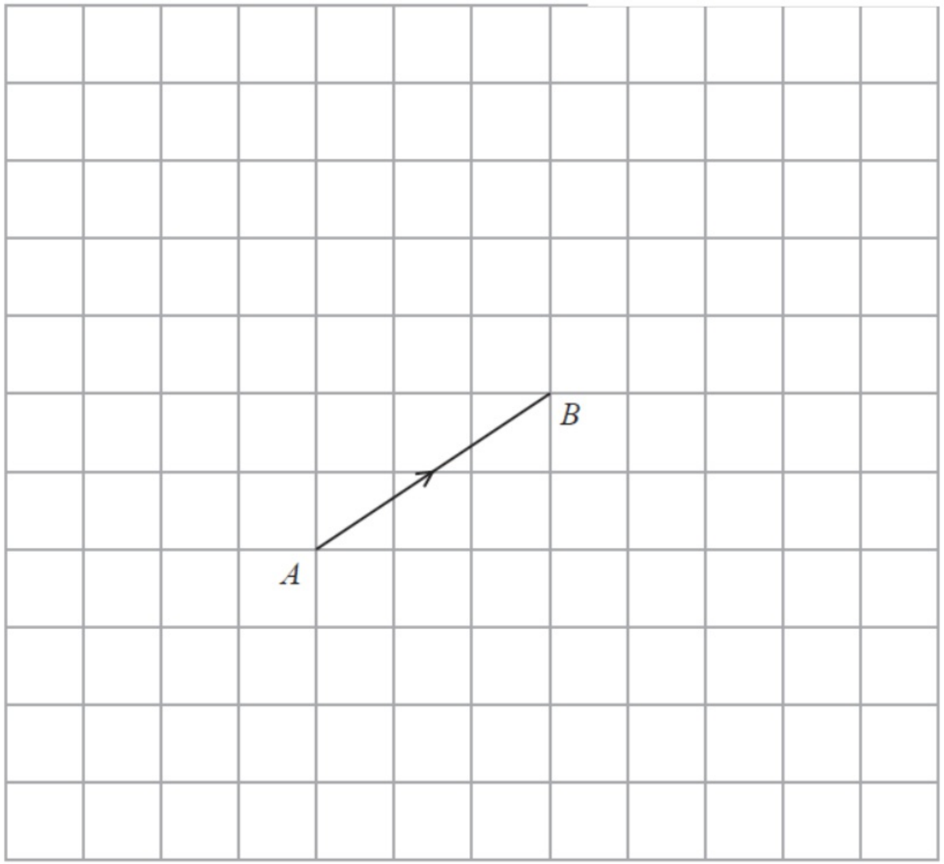
(a) On the grid, draw $\overrightarrow{BC}$.

(1)

$\overrightarrow{AD} = \overrightarrow{AB} - \overrightarrow{BC}$

(b) On the grid, mark with a cross (×) the position of D.
Label this point D.

(2)



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10 $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

$\overrightarrow{AB}$ is shown on the grid.

$\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ ... Right / left (+ / −)
... Up / Down (+ / −)

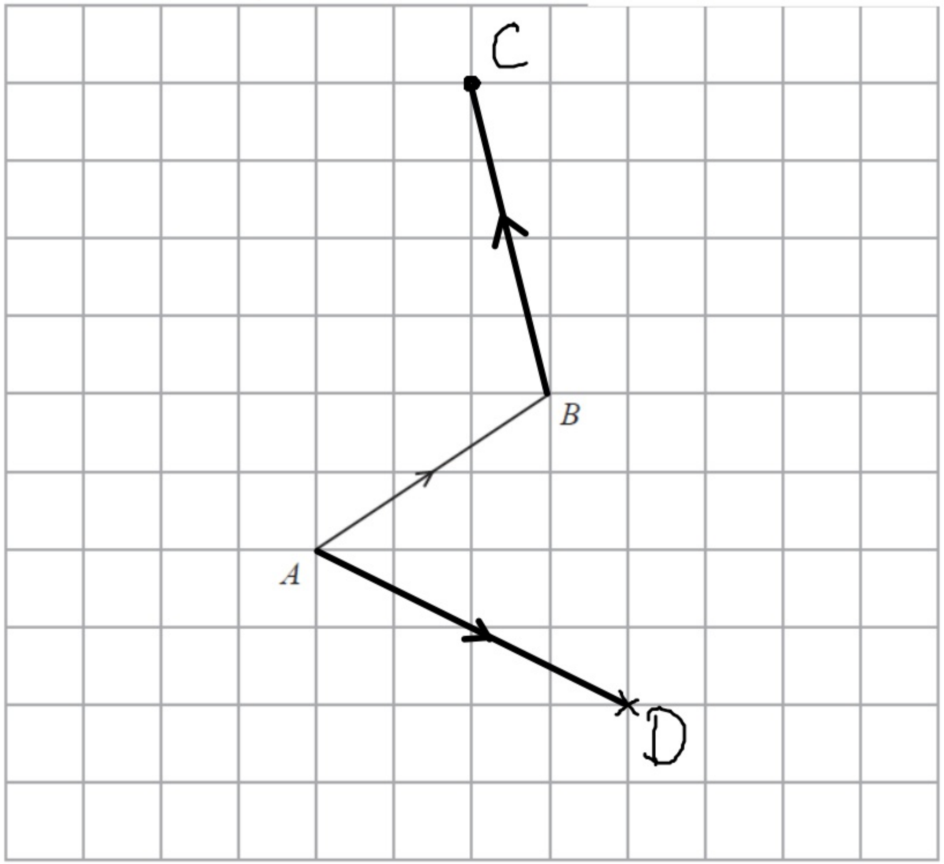
(a) On the grid, draw $\overrightarrow{BC}$. ✓

(1)

$\overrightarrow{AD} = \overrightarrow{AB} - \overrightarrow{BC}$

(b) On the grid, mark with a cross (×) the position of D.
Label this point D.

(2)



$$\overrightarrow{AD} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} - \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

$$= \begin{pmatrix} 4 \\ -2 \end{pmatrix}$$

AQA

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1 G52

$\mathbf{a} = \begin{pmatrix} -4 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$

Circle the vector $2\mathbf{a} + \mathbf{b}$

[1 mark]

$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -5 \\ -1 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$

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1 $\mathbf{a} = \begin{pmatrix} -4 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$

G52

Circle the vector $2\mathbf{a} + \mathbf{b}$

[1 mark]

$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -5 \\ -1 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$

$2a \rightarrow 2\begin{pmatrix} -4 \\ -1 \end{pmatrix} = \begin{pmatrix} -8 \\ -2 \end{pmatrix}$

$\begin{pmatrix} -8 \\ -2 \end{pmatrix} + \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \begin{pmatrix} -5 \\ -3 \end{pmatrix}$

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11 $\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

11 (a) Work out $\mathbf{a} + \mathbf{b} + \mathbf{c}$

[2 marks]

G52

Answer $\begin{pmatrix} \\ \end{pmatrix}$

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$$\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix} \qquad \mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \qquad \mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$$

11 (b) Show that $\mathbf{a} + 2\mathbf{c}$ is parallel to $\mathbf{b}$ **[2 marks]**

G52

A23

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11 $\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

11 (a) Work out **a + b + c**

[2 marks]

G52

$$\begin{pmatrix} 6 \\ -10 \end{pmatrix} + \begin{pmatrix} -1 \\ 2 \end{pmatrix} + \begin{pmatrix} -4 \\ 7 \end{pmatrix}$$

$-10 + 2 + 7$

$6 + -1 + -4$

$6 - 1 - 4 =$

Answer $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$

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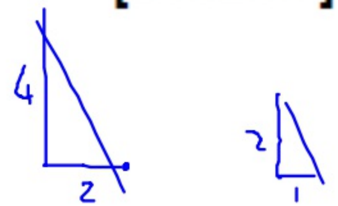
$$\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix} \qquad \mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \qquad \mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$$

11 (b) Show that **a + 2c** is parallel to **b** **[2 marks]**

G52
A23

$$\begin{pmatrix} 6 \\ -10 \end{pmatrix} + \begin{pmatrix} -8 \\ 14 \end{pmatrix}$$

$$= \begin{pmatrix} -2 \\ 4 \end{pmatrix} \quad \xrightarrow{\div 2} \quad B = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \quad (\times 2)$$



$\frac{4}{2} = -2$

$\frac{2}{1} = -2$

Same gradient so parallel.